REMARKS

The present amendment is submitted in an earnest effort to advance this case to issue without delay.

1. The applicant notes that the Examiner found allowable subject matter to be present in the original **claims 9 – 13 and 21** in the office action mailed 8/15/2002, which then formed the basis for the amendment **claims 30 - 34 and 42** which the Examiner again found allowable in the office action mailed 3/26/2003 and which form the basis for the **claims 44 - 47 and 61** of the second amendment considered in the office action mailed 8/11/2004 and re-submitted herewith. In remarks X and Y below, the applicant presents argumentation why **claims 45 – 47 and 61** should be allowable.

2. In the interest of expediting prosecution and reducing cycle time, **claim 44** has been cancelled and two new independent **claims 63 and 64** are added.

3. **Claim 45** has been rewritten in independent form, having the same language and intent as the original **claim 11 and claim 32**, both previously having been found allowable as noted above.

4. **Claim 63** is based on the dependent **claim 46** rewritten in independent form, having the same language and intent as the original **claim 12 and claim 33**, both previously having been found allowable as noted above.

5. **Claim 64** is based on the dependent **claim 47**. The applicant notes that the Examiner indicated in the office action mailed 8/11/2004 that **claim 47** would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

5. The amendment claims were rejected, in part, under 35 USC 102 and 35 USC 103(a) as allegedly anticipated by the KLOSS Patent 5,046,104 in view of PARK Patent 6,073,770. While Applicant is not certain that that rejection is correct in the sense that it is clear that the case of the reference is a carrying case in the sense of the invention or has a storage compartment in the sense of the invention or has moveable interior walls in the sense of the invention, certainly neither the Kloss nor Park structure specify the walls of the housing consisting of one outer layer of material with a maximum thickness of 4 mm and a high modulus of elasticity in shear and at least one inner layer of a material with a minimum thickness of 4 mm and a high modulus of elasticity in shear, a high damping and a low density which have the effect of greatly reducing unwanted vibrations and resonance of the housing.

In the office action 8/11/2004, the Examiner found that Kloss fails to disclose the specifics pertaining to the carrying case materials of construction, but maintained that a standard briefcase has multiple layers "sandwiched" together providing an outer layer and an inner layer as shown in Park. Further, the Examiner found that Park discloses a sandwich construction with layers of material, as well as an air-permeable outer skin which reads on leather. The

Park patent does not disclose sufficient information to enable an analysis of its acoustic properties of the briefcase walls, which however do not include a sandwich construction. The sandwich construction referred to in the Park patent pertains to the shock-absorbing elements which are clearly designed to be soft and pliable rather than to increase the rigidity of the case, and as such are not pertinent to this invention.

5. **Claim 45** is in contrast quite specific, requiring an inner and outer layer of material with a high "modulus of elasticity in shear", said term also being commonly called simply "modulus of rigidity" or "shear modulus". For supporting argumentation and analysis **please see the affidavit below**. Typical materials displaying a high modulus of elasticity in shear are steel, aluminium, fibreglass, Carbon-fiber, and to a lesser extent wood, not however leather. Wood, especially balsa wood, is very well suited as a material for the second layer in **claim 45 and 46** as having a combination of high modulus of elasticity in shear, low density (to reduce weight) and high damping. The claimed sandwich construction (in the preferred embodiment of the invention including aluminium, balsa and fibreglass) represents a significant improvement in acoustic performance, weight and thickness compared to prior art.

6. **Claim 46** and independent **claim 63** describe a further enhancement of these properties through the utilization of materials having anisotropic (directional) load-bearing characteristics. None of the patents cited indicate such materials, nor can they be inferred from ordinary practice. In the **affidavit** below, specific characteristics are described whereby such

anisotropic materials are shown to have superior performance characteristics when combined with the claimed sandwich construction compared to ordinary materials in the application of a portable briefcase which doubles as a high-quality loudspeaker system. This invention would not have been obvious for one of ordinary skill in the art at the time the invention was made.

6. **Claim 47** and independent **claim 64** describe a further enhancement of the acoustic properties of the invention in that the movable panels are arranged so that they also serve as passive membrane or membranes in a tuned passive radiator loudspeaker enclosure. This invention would not have been obvious for one of ordinary skill in the art at the time the invention was made. In the **affidavit** below, general remarks as to the performance advantages of this claim are given. Further information is available from the applicant on request.

7. On December 5, 2004, the applicant submitted a petition for a second month extension of the term together with a charge form for the official fee, a copy of such petition and charge form being enclosed together with this amendment. Such extension is intended to be valid up to January 11, 2005.

Affidavit Under 37 CFR 1.132

The object of the invention is "... provide a briefcase or carrying case..... and ... a lightweight portable loudspeaker system, which despite its light weight provides satisfactory sound reproduction."

For the purposes of the best possible sound reproduction, it is absolutely crucial that the walls of the briefcase provide the maximum possible isolation of acoustic vibrations so that the sound emanating from the loudspeakers is not distorted by the sound caused by the sympathetic vibrations of the briefcase itself. Whereas in conventional high-quality loudspeaker enclosures the sheer weight and thickness of the enclosure walls helps minimize these vibrations, a portable high-quality loudspeaker system which doubles as a briefcase represents a particular challenge to find a construction method for the case walls which minimizes vibrations but is at the same time very light and at the same time very thin.

For this purpose, the patent specifies a sandwich construction with multiple layers of materials as described in **claim 45** "wherein the walls of the housing are of a multi-layered or sandwich construction consisting of at least one first layer of material with a maximum thickness of 4 mm and a high modulus of elasticity in shear, and of at least a second inner layer of material with a minimum thickness of 4 mm and a high modulus of elasticity in shear, high damping and low density, and of a third layer of material with a maximum thickness of 4 mm and a high modulus of elasticity in shear)."

In the attached diagram please see a chart depicting the modulus of elasticity in shear for different materials. It is evident that typical materials displaying a high modulus of elasticity in shear are steel, aluminium, fibreglass, Carbon-fiber, and to a lesser extent wood, not however leather.

Material	Shear modulus psi
Steel	11506430
Copper	6485970
Carbon-Fiber	6000000 to 24000000
Titanium	6007140
Brass	5818510
Aluminium	4062800
Fibreglass + Alu.	1438304
Kevlar	2756900
Magnesium	2466700
Douglas Fir	594910
Plywood	580400
Balsa Wood	507850
Polyvinyl Chloride (Kydex)	189000
Alu Hexcell	30471
Leather	5079
H90 Polyfoam	3918
Silicone	1451
Polyurethane	726
Rubber	580

Wood, especially end-cut balsa wood, is very well suited as a material for the core or second layer in **claims 45 and 46** as having a combination of high modulus of elasticity in shear, low density (to reduce weight) and high damping.

Material	Modulus of Rigidity lb/sq.in.	Density lb/cu ft	Rigidity to Density cu.ft./sq.in.	Damping STC
End-cut Balsa Wood	507850	9	56428	18
Carbon-Fiber	6384400	115	55517	6
Kevlar	2756900	108	25611	6
Steel	11506430	602	19114	14
Aluminium	4062800	215	18872	7
Magnesium	2466700	139	17709	7
Douglas Fir	594910	34	17266	28
Titanium	6007140	350	17163	11
Fibreglass	1438000	108	13359	6
Plywood	580400	48	12134	25

Copper	6485970	691	9386	9
Brass	5818510	661	8801	9
Aluminum Honeycomb	30471	5	6094	1
Polyvinyl Chloride (Kydex)	189000	93	2025	10
H90 Polyurethane Foam	3918	5	784	20
Leather	5079	71	72	35
Silicone	1451	156	9	20
Polyurethane	726	86	8	30
Rubber	580	89	7	40

The sympathetic vibrations of the briefcase walls are caused by the rapid pressure variations of the sound waves within the enclosure. The goal of the sandwich construction is to resist and dampen these vibrations by providing very stiff enclosure walls which resist the bending forces induced by the pressure waves, and by providing enclosure walls utilizing materials which help dampen such vibrations as should occur.

The effective overall isolation of the sound wave from the interior to the exterior can be expressed in decibels of exterior sound pressure level caused by the sympathetic vibrations of the briefcase walls resulting from a given internal pressure wave. For our briefcase we shall concentrate on the crucial low frequency range of 100Hz and below. Assuming the principal mode of transmission is through the outside walls of the briefcase, a close approximation of sound pressure transmitted through the enclosure walls is provided by the equations which follow. A mathematical description of the damping effects from the materials selection is beyond the scope of this affidavit, so the damping is assumed to be zero in the following derivation. Similarly, the acoustic resonances of the enclosure volume are very specific to the dimensions and construction details of the briefcase, and will be ignored in the following.

Based on an analysis of the stress and strain associated with a sandwich material subjected to a uniform pressure wave differential across its surface, the resistance to bending can be closely approximated by the equations as follows (main radiating area for acoustic puposes being the large outside wall of the briefcase treated as a flat plate fixed on all four edges):

Equation 1: Rigidity contribution of layer one and three (lb-in):

$r_{L13} = K_{L3} X E_{L1} X t_{L1} X E_{L2} X t_{L2} X h^2 / ((E_{L1} X t_{L1}) + (E_{L2} X t_{L2}))$

where:

- r_{L13} is rigidity of layer one and three together (lb-in)
- $K_{ab0.7}$ is coefficient of bending for flat sandwich plate with an a to b ratio of 0.7 rigidly attached on all four edges (approx. 0.002)
- E_{L1} is modulus of elasticity of Layer one (lb/in^2)
- E_{L1} = G_{L1} X 2.5 for homogenous materials
- G_{L1} is modulus of elasticity in shear of Layer one (lb/in^2)
- t_{L1} is thickness of Layer one (inches)
- h is thickness of core Layer two (inches)

Equation 2: Rigidity contribution of core Layer two (lb-in):

$r_{L2} = K_2 X G_{L2} X h^3$

where:

- r_{L2} is rigidity of core Layer two (lb-in)
- K_2 is coefficient of bending for core Layer two (approx. 0.45)
- G_{L2} is modulus of elasticity in shear of Layer two (lb/in^2)

Equation 3: The vibrational amplitude of the enclosure walls is then (inches):

$H = q \times a^2 \times b^2 / (r_{L13} + r_{L2})$

where:

- H is the vibrational amplitude of the enclosure walls (inches)
- q is amplitude of internal pressure wave (lb/in^2)
- a is width of largest outside wall of briefcase (inches)
- b is length of largest outside wall of briefcase (inches)
- r_{L13} is rigidity of layer one and three together (lb-in)
- r_{L2} is rigidity of core Layer two (lb-in)

Equation 4: Acoustic Impedance of the enclosure walls (ohms):

$Z_s = \pi^2 \times p_o \times a^2 \times b^2 \times f^2 / c$

where:

- Z_s is acoustic impedance of the enclosure walls (ohms)
- p_o is the density of air at sea level (1,18 kg/m^3)
- a is width of largest outside wall of briefcase (meters)
- b is length of largest outside wall of briefcase (meters)
- f is frequency (Hertz)
- c is speed of sound at sea level (344 meters per second)

Equation 5: Acoustic power of the sympathetic vibrations (watts):

$P_{ak} = Z_s \times H^2 \times f^2 \times \pi^2$

where:

- P_{ak} is acoustic power of the sympathetic vibrations (watts)
- Z_s is acoustic impedance of the enclosure walls (ohms)
- H is the amplitude of the sympathetic vibrations of the briefcase wall (from Equation 3, but in meters)

Equation 6: Sound pressure isolation at 1 meter distance referenced to internal sound pressure wave (decibels):

$P = -10 \log P_{ak}$

where:

- P Sound pressure isolation at 1 meter distance referenced to internal sound pressure wave (decibels)
- P_{ak} is acoustic power of the sympathetic vibrations (watts)

For the preferred embodiment (in fact the prototype) of this invention, the attached **Chart 1** indicates the relative acoustic isolation according to the above equations for a wide range of materials.

From this chart it is evident that the sandwich construction described in **Claim 45** is indeed far superior in acoustic isolation (with a damping of 51dB for the preferred embodiment with the quarter-inch core layer) than a briefcase using leather materials (damping of 20dB for an example of a "normal" briefcase consisting of two layers of leather over a one-eighth inch plywood core) or a briefcase combining the Kydex facings (layers one and three) and polystyrene (core or layer two) materials described in the preferred embodiment in the Kloss patent (showing a damping of only 27dB with the quarter-inch core layer). The Park patent does not disclose sufficient information to enable an analysis of its acoustic properties of the briefcase walls, which however do not include a sandwich construction. The sandwich construction referred to in the Park patent pertains to the shock-absorbing elements which are clearly designed to be soft and pliable rather than to increase the rigidity of the case, and as such are not pertinent here.

The sandwich construction described in the current invention using materials with a high shear modulus also reduces the weight and thickness of the briefcase walls, for instance in the preferred embodiment reducing the weight of the walls by a factor of two compared to the preferred embodiment of the Kloss patent (said embodiment showing a core layer 0.56 inches to 0.625 inches) and at the same time reducing the thickness of the briefcase by one-half inch for the same internal volume of the case (noting that this preferred Kloss embodiment still displays inferior acoustic isolation (47dB to 50dB) even at this thickness).

Claim 46 and independent **claim 63** describe a further enhancement of these properties through the utilization of materials having anisotropic (directional) load-bearing characteristics. By utilizing an anisotropic material having a high modulus of elasticity in shear such as unidirectional carbon-fibers embedded in an epoxy substrate for instance in layer one or layer three, and orienting them parallel to the direction of maximum stress, the acoustic performance is greatly increased. For instance in the prototype, unidirectional carbon-fibers reinforce layer three, being oriented in parallel to the narrower edge of the briefcase walls, which have the potential of providing - depending on the carbon fiber used - anywhere from half the rigidity of steel up to twice the rigidity of steel in the specified direction but weighing only one-fifth as much (see also the above table of materials).

The detailed calculation of the acoustic isolation of a sandwich wall featuring an anisotropic layer such as that described above is

beyond the scope of this analysis, depending largely again on the detailed dimensions, stress directions and the specific directional load-bearing characteristics of the fibers and the substrate involved. A computerized finite-element analysis would be appropriate and advisable so as to optimize the orientation of the fibers to the specific needs of the briefcase involved.

The analysis in the prior section for anisotropic carbon-fiber assumes an idealized case of layer one and layer three consisting of anisotropic high-modulus graphitised carbon fiber such as Torayca T400HB from Toray Industries in an epoxy substrate aligned along the lines of maximum stress. This analysis predicts an acoustic isolation of 67dB, an acoustic isolation superior to that achieved in conventional high-quality loudspeaker enclosures utilizing 1.25 inch high-density MDF wooden particle board, yet the briefcase walls with this material specification weigh only a small fraction of that and have a total thickness of only 0,385 inches.

Claim 47 and independent **claim 64** describe a further enhancement of the acoustic properties of the invention in that the movable panels are arranged so that they also serve as passive membrane or membranes in a tuned passive radiator loudspeaker enclosure. In a passive radiator design, the passive membrane is tuned together with the enclosure volume and the loudspeaker to vibrate so as to reinforce the bass sound emanating from the loudspeaker in phase at a particular range of frequencies, which enables a greater bass frequency amplitude from a smaller enclosure, this being a particular advantage considering the enclosure volume of the briefcase is small. The claims specify

that the internal compartment lid be attached elastically so that the lid(s) can be tuned as passive membrane(s).

The specific tuning requirements and calculations are far beyond the scope of this affidavit, but in general it is advantageous that the passive membrane (in the invention the movable panels which form compartment lids) be larger in area than the loudspeaker cone, which is true for the preferred embodiment inasmuch as the storage compartment lids or movable panels are designed to be large in order to facilitate the placement or removal of the documents or electronic equipment therein. Further it is advantageous that the vibrating membrane have a significantly higher mass than the loudspeaker membrane, which in the invention is also given through the necessity of the movable panels or compartment lids.

Further documentation supporting this invention in the sense of **claim 64** is available upon request from the applicant.

Respectfully submitted by the applicant

Bert E. Holland

Enclosures:

- Chart 1: Acoustic Isolation of the Briefcase Walls
- Photos: Prototype of invention, preferred embodiment
- Letter of December 5, 2004
- Form PTO-SB/22 from December 5, 2004
- Form PTO-2038 from December 5, 2004

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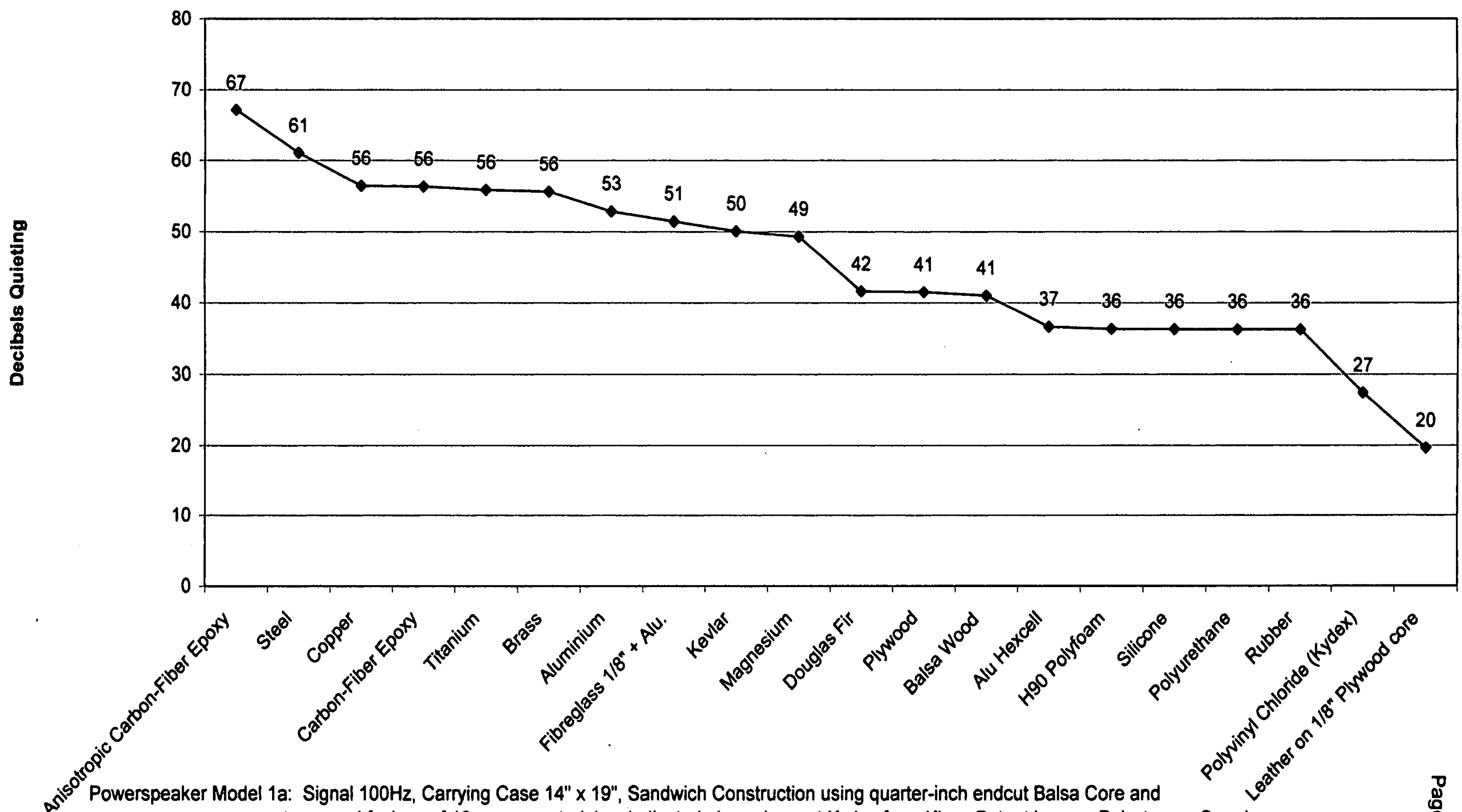
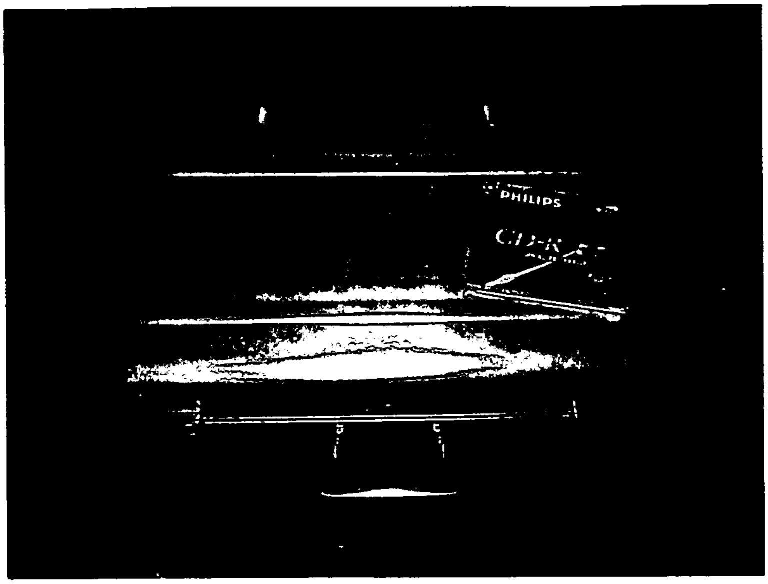
Chart 1: Acoustic Isolation of Sandwich Construction for the Briefcase walls
(Briefcase walls taken singly, Quieting at 100Hz, internal speaker driven)



Powerspeaker Model 1a: Signal 100Hz, Carrying Case 14" x 19", Sandwich Construction using quarter-inch endcut Balsa Core and two equal facings of 16 gauge material as indicated above (except Kydex from Kloss Patent is on a Polystyrene Core)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